Increasing levels of rare element found worldwide

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Dartmouth researchers have determined that the presence of the rare element osmium is on the rise globally. They trace this increase to the consumption of refined platinum, the primary ingredient in catalytic converters, the equipment commonly installed in cars to reduce smog. A volatile form of osmium is generated during platinum refinement and also during the normal operation of cars, and it gets dispersed globally through the atmosphere.

While osmium is found naturally, the researchers were surprised to discover that most of the osmium in rain and snow, and in the surface waters of rivers and oceans, is produced during the refining of platinum. "It's interesting, maybe ironic, that we stopped adding lead to gasoline in the 70s so that catalytic converters could be introduced to remove smog from car exhaust," says Dartmouth Associate Professor of Earth Sciences Mukul Sharma. "Now we learn that using platinum in the converters is responsible for an increase in osmium. Fortunately, unlike lead, the concentration of osmium in water is extremely small and may not adversely affect biology."

Sharma worked with Dartmouth Ph.D. student Cynthia Chen and Peter Sedwick at Old Dominion University. Their study will be published in the online edition of the Proceedings of the National Academy of Sciences during the week of April 20, 2009.

The research team measured osmium in precipitation in North America, Europe, Asia, and Antarctica, and in both surface water and deep water

from the North Atlantic, Pacific, Indian, and Antarctic (or Southern) Oceans. Human-made osmium also comes from chromium smelters, hospital incinerators, and the normal operation of cars, but it's primarily the industrial extraction and refining of platinum that produces the bulk of the osmium found in rain and snow.

Sharma explains that about 95 percent of the world's platinum comes from South Africa and Russia where it is roasted at extremely high temperatures during the extraction and refinement process. The process removes sulfur present in the ore as sulfur dioxide and, at the same time, releases osmium, which is abundant in the ore.

"Neither South Africa nor Russia has implemented environmental laws regulating this, but if steps are taken to minimize these emissions, the incidence of osmium will certainly subside," says Sharma. "It's surprising that we are seeing this measurable increase in osmium on a global scale, and we can virtually blame it on one thing: our insatiable demand for platinum-based catalytic converters."

Source: Dartmouth College